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Montana Water Resources Board

FIRST
BIENNIAL REPORT

TO THE
GOVERNOR OF MONTANA

July 1, 1966
June 30, 1968



EVERETT V. DARLINTON
Director

DATE DUE

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MONTANA WATER RESOURCES BOARD

BIENNIAL REPORT



North Fork Smith River Storage Reservoir, Meagher County

July 1, 1966

June 30, 1968

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LETTER OF TRANSMITTAL

December 1, 1968

The Honorable Tim Babcock
Governor of Montana
State Capitol Building
Helena, Montana 59601

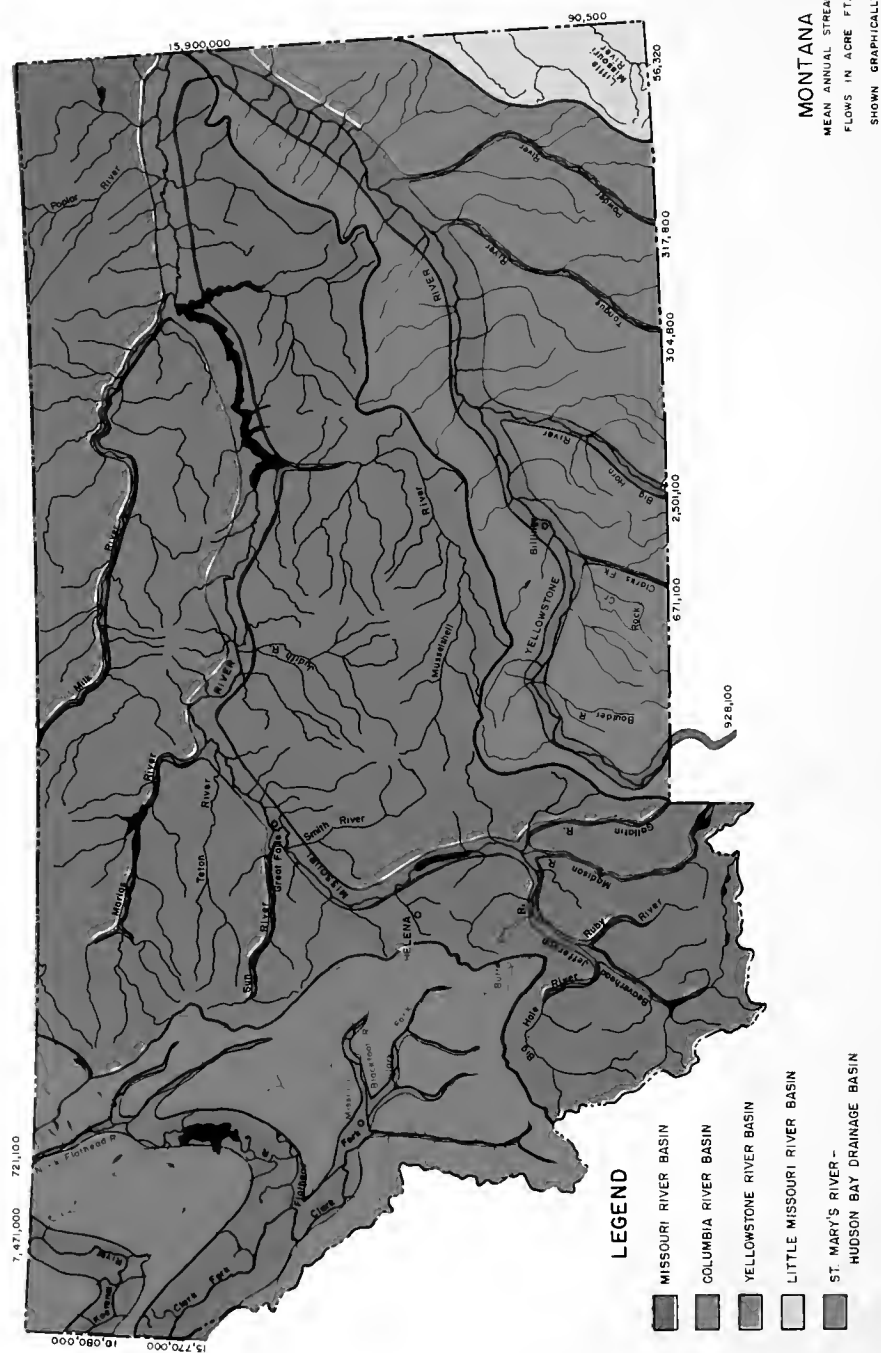
Dear Governor Babcock:

I have the honor to submit herewith the first Biennial Report of the Montana Water Resources Board. This report covers the activities of the Board for the two-year period July 1, 1966, through June 30, 1968.

THE MONTANA WATER RESOURCES BOARD

Everett V. Darlinton, Director

MAJOR DRAINAGE BASINS, STREAM FLOWS, AND LARGER LAKES AND RESERVOIRS IN MONTANA



INTRODUCTION AND SUMMARY

Several important events marked the 1966-1968 biennium as especially significant for the Montana Water Resources Board in particular, and for state water matters in general. Among the most important of these are the following:

1. The enactment of the Montana Water Resources Act of 1967.
2. The initiation of a comprehensive state water planning program.
3. The establishment of a program for the regulation of weather modification.
4. The establishment of the first controlled ground water district in the State.
5. An expansion and acceleration of the Water Resources Survey program.

These events and other items of special interest are reviewed in this introductory section. Additional details on the subjects discussed in this section, together with reports on the Board's general operations, constitute the main text of this Biennial Report.

New Director Appointed

The 1967 Legislature abolished the State Water Conservation Board and created the Montana Water Resources Board. In the Act (the Montana Water Resources Act of 1967) the Legislature explicitly expanded the Board's authority, notably its planning authority. Everett V. Darlington was appointed Director of the Water Resources Board. Mr. Darlington assumed that position on July 1, 1967. He succeeded Mr. Alex McDermott, Director of the former State Water Conservation Board, who was named as alternate representative to the new Pacific Northwest River Basins Commission. Mr. McDermott continued to serve as one of Montana's members to the Western States Water Council.

Another organizational change of importance implemented by the 1967 Legislature was the separation of the Planning Board from the Water Board and the creation of the State Department of Planning and Economic Development in place of the Planning Board.

Montana Water Resources Act of 1967

One of the most important pieces of legislation passed by the 1967 Legislature and signed into law by Governor Babcock was the Montana Water Resources Act of 1967. This Act stated Montana's general water policy and explicitly designated the Water Resources Board as THE State water agency, responsible for, among other things, water planning, project construction, and the coordination of all water programs in the State. The Act was also quite specific in its recognition of beneficial water uses. The Board was directed by this Act to formulate a "comprehensive coordinated multiple purpose state water plan." Funds appropriated for this planning program were not available until July 1, 1967, although the Board had been working on state planning well in advance of that date.

Weather Modification

Another important piece of legislation passed by the 1967 Legislature provided for the licensing and regulation of weather modification (cloud seeding) activity within the State. The Water Board was the agency designated as responsible for administering this law and developing a weather modification regulation program. On July 1, 1967, the Board inaugurated a weather modification licensing and permit program.

Water Resources Survey

The Board's Water Resources Survey program was considerably expanded and accelerated during the 1966-1968 biennium. The expansion included the hiring and training of a number of new fieldmen and draftsmen. This personnel increase will permit an increased rate of county surveys to be conducted and published during the next few years in conjunction with the State Water Plan. In the past, the survey has been conducted at the rate of one or two counties per year. This rate is being increased to four or five counties per year.

During the 1966-1968 biennium, water resources survey reports were completed and published for the four counties of Blaine, Hill, Valley and Phillips. Field work is now in progress in five counties, namely, Toole, Glacier, Liberty, Mineral and Sanders.

Tongue River Development

During the biennium a complicated legal problem between the Board and the Tongue River Water Users Association was under negotiation. The basic issue was the sale and use of water from the Tongue River Reservoir. The problem arose as a result of continuing interest in obtaining substantial amounts of water for industrial use in the event of development of the vast coal reserves in the area.

Key issues and questions involved in the matter include:

1. The total firm supply of water available from the existing reservoir,
2. The amount of water from the existing reservoir guaranteed to agriculture and what firm amount remains for industrial or other uses,
3. How much surplus or presently unused water from the Tongue River belongs to Montana under the terms of the Yellowstone Compact and how much could be relied upon for development and storage as a firm supply by enlarging the existing Tongue River Reservoir or with new storage dams or both,
4. The feasibility of enlarging the existing Tongue River Reservoir, and,
5. The location and feasibility of new dams and reservoirs along the Tongue River.

To assist in evaluating and resolving the above matters, particularly the technical ones such as determining water supplies, dam locations, and cost estimates, the Board retained the world renowned engineering-consulting firm of Bechtel Incorporated. Principal tasks undertaken by Bechtel were:

1. A feasibility investigation of raising the existing Tongue River Dam,
2. Location and evaluation of potential dam sites downstream from the present dam,
3. A water allocation study to estimate Montana's share of Tongue River water under the terms of the Yellowstone Compact and the firm supply we could expect under long term drought conditions and,
4. Preparation of final design and cost estimates for a dam at the most favorable downstream site.

The first three items were completed this biennium. The final design and cost estimates are expected in December 1968. The information from the water allocation reports has been very valuable in resolving problems associated with negotiating a new contract with the Tongue River Water Users Association. Agreement on a new contract is expected within the next few months.

Ground Water

The keynote of the groundwater program during the 1966-1968 biennium was the establishment of the first controlled groundwater district in the State. The district, located in Prairie, Wibaux and Fallon Counties in eastern Montana, is commonly referred to as the "Fox Hills Ground Water Area." The action for a controlled district arose due to a dispute between ground water users in the area and the contention that excessive withdrawals were emerging and causing harm to some users. The dispute developed as oil production in the area used increasing amounts of ground water to repressure the oil fields.

Before the district was created, the Board conducted extensive investigations of the area, its geologic structure, water pressures, water levels and related items using data gathered by the U. S. Geological Survey in a special study. Public hearings were held in which parties to the dispute were able to present their cases. Finally, after careful examination of the evidence the Board created the district and prepared appropriate regulations.

Pacific Northwest River Basins Commission

On March 6, 1967, a Presidential Executive Order established the nation's first river basin commission, the Pacific Northwest River Basins Commission. Montana had urged the creation of this Commission. Mr. James Murphy, a prominent Kalispell attorney and state legislator, was appointed as Montana's representative to the Commission and Mr. Alex McDermott, former Water Board Director, was named alternate representative.

The Montana Water Resources Board immediately began providing technical assistance and information to the Montana representatives on the Commission. In addition, Board personnel are actively engaged in technical work for the Columbia-North Pacific Study which is being coordinated by the Commission. This work includes providing information and research about Montana's portion of the Columbia Basin and reviewing, criticizing, and amending when necessary the plans and reports which affect western Montana.

Engineering and Project Investigations

During the biennium the engineering division provided numerous services to 26 of the Board's irrigation projects. Included in the work completed this biennium were the installation of information signs, building of recreational facilities, installation of new water measuring devices, cleaning of canals, bridge repairs, supervision of canal lining, and other project maintenance. The engineering division also began a series of ex post cost-benefit studies and recreation studies during the biennium.

Eight proposed projects were under investigation by the engineering division during this period.

State Water Plan

Work on Montana's comprehensive State Water Plan began early in the biennium with the preparation of a framework outline specifying many aspects of water and related land resources which are to be analyzed prior to preparation of development and conservation plans. This outline will be modified as the study proceeds with the evaluation of Montana's water resources. To assist in the preparation of the state water plan, the Board retained the consulting services of a former Montanan and internationally known water specialist, Dr. G. B. Maxey.

The Board is not endeavoring to undertake all of the detailed studies required for the state water plan. A number of state agencies are cooperating with the Board by using their particular departmental and personnel expertise. Worthy of special mention in this respect are the following efforts utilizing the research capabilities of the University system: (1) the development of a computerized basin simulation model by Montana State University at Bozeman, which is receiving direct financial support from the Board, (2) the state economic base study being conducted by the Bureau of Business and Economic Research at the University of Montana, Missoula, which is also receiving direct financial support from the Board, and (3) the development of a ground-water data system by the College of Mineral Science and Technology at Butte in cooperation with the U. S. Geological Survey, with the support of the Board.

At this time the Board has proposed a set of assumptions to guide the four phases of the state water planning procedure. These phases are: Phase I, an inventory of existing water data including directories of personnel and programs involved in water development, a resume of state water law and a registry of dams and storage in the state. An integral part of this first phase is the development of a state water data storage and retrieval system. Phase II, an estimation of water availability and future needs. Phase III, recommendations for action and developments to meet estimated needs. Phase IV, implementation of the development plan.

Late in this reporting period plans were made to hold a public hearing, as required by law, on the progress of the State Water Plan.

ENGINEERING AND PROJECT OPERATION AND MAINTENANCE

The primary responsibility of the Engineering Department is to provide engineering services to local groups and water users associations to study, design, construct, and assist in the maintenance of State-owned water projects. The Board's engineering staff is equipped to make detailed investigations of proposed projects, and to submit to local groups proposals for construction together with cost-estimates, and alternate methods of financing. If a proposal is acceptable to a local group and sufficient interest is shown to warrant construction, the Board's Engineering Department then provides detailed engineering drawings, contracts and the construction supervision necessary to develop the project.

Regarding operations of existing projects, the Engineering Department makes annual inspections of all of its major storage structures and recommends to water users associations steps necessary for the maintenance of the structures. Should services of the Engineering Department be required for supervision of contracts and construction of maintenance works, this is then handled by the Board. The Board's Engineering staff also makes annual inspections when requested by associations, or when the Board deems it necessary, on all irrigation canals and provides the necessary technical staff when needed.

The Engineering Department also cooperates with other State and Federal agencies in the development of outdoor recreation plans on Board projects and it provides technical services for the construction of desired recreational facilities on these projects.

Our project maintenance staff is primarily interested in the over-all management of existing projects. This includes operation and maintenance and the overseeing of the measuring of water in distribution networks. This staff includes hydrographers and equipment operators (who are needed to provide emergency repairs or to do small odd jobs for projects and associations where private contractors are not available).

The following is a summary of the work carried on by the Board's Engineering and Project Maintenance Division during this reporting period:

ENGINEERING AND PROJECT MAINTENANCE

Montana Water Resources Board

July 1, 1966 - June 30, 1968

Broadwater-Missouri Diversion—Broadwater County

- Engineering services for installation of water measuring devices.
- Installed two project information signs.
- Construction supervision of washout of Main Canal.
- Technical assistance for concrete lining of 2,240 feet on Main Canal.

Tongue River Reservoir—Big Horn and Custer Counties

- Technical advisor for proposed new water marketing contract with Tongue River Water Users' Association.
- Provided technical advice for industrial contracts regarding water from the proposed reservoir.
- Consulted with private consulting firm on an additional engineering study regarding a larger reservoir than originally planned.
- Provided recreational facilities on projects.
- Completed the construction of a sheet piling cut-off on spillway.
- Installed three project information signs.

Willow Creek Dam—Gallatin and Madison Counties

- Installed three project information signs.
- Conducted cost-benefit study.

Rock Creek Storage—Carbon County

Installed three project information signs.
Supervised and inspected operation of dam during 1967 flood that damaged spillway.
Negotiated R/W agreements in connection with recreational use of reservoir.

Nilan Storage Reservoir—Lewis and Clark County

Installed project information signs.
Facilities installed at picnic area.
Installed three water recording stations.

Ruby River Dam—Madison County

Engineering staff supervised repairs to break in West Side Canal.
Installed project information signs.
Repaired recording station.

North Fork Smith River Storage—Meagher County

Installed project information signs.
Facilities installed in two picnic areas.

Deadman's Basin—Golden Valley, Musselshell and Wheatland Counties

Installed project information signs.
Replaced concrete transition section on outlet works of dam.
Supervised operation of the reservoir during the June 1967 flood and repaired damages caused by the flood.

Columbus Ditch—Stillwater County

Installed project information sign.
Applied demossing chemical to canal.
Negotiated with Highway Department for interstate highway relocation.

Hysham Project—Treasure County

Conducted a cost-benefit study.
Engineering staff supervised construction of 11,706 feet of concrete canal lining.
Inspected operation of motors in main pumping plant.
Negotiated for the purchase of a new pump.

Nevada Creek Project—Powell County

Repaired outlet works and measuring weir.
Conducted a cost-benefit study.
Two project information signs installed.
Prepared recreation survey.

Sidney Pumping Project—Richland County

Sponsored a rehabilitation plan for the project.
Designed and surveyed for relocation of No. 1 pumping plant.
Equipment crew excavated for, placed, and backfilled a new section of pipe.
Two project information signs installed.

Flint Creek Dam—Granite County

Canal banks sprayed for weeds.
Canals demossed by chemicals.
Three project information signs installed.

Upper Musselshell Project—Meagher & Wheatland Counties

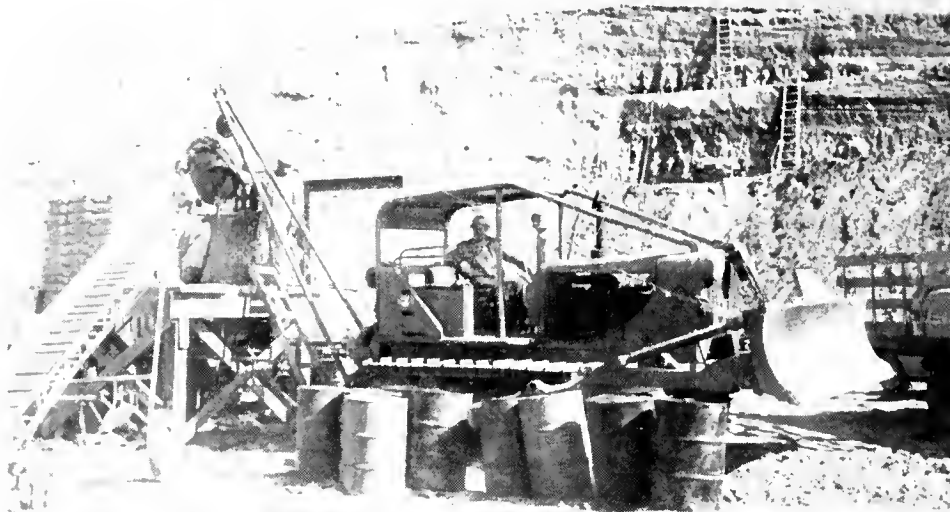
Conducted cost-benefit study.
Eight project information signs installed.
Equipment crew repaired concrete spillway structure for Bair Dam.
Prepared recreation survey.
Replaced rock and gravel at Martinsdale Reservoir.

Park Branch Canal—Park County

Two project information signs installed.

Livingston Ditch Project—Park County

Project information sign installed.
Corrective repairs to canal flume in Livingston city limits.



Project maintenance such as this is a key Water Board function.

West Fork Bitterroot—Ravalli County

Installed two project information signs.
Assisted in payment of salary of Water Commissioner.
Installed two water measuring recorders.

Ackley Lake Reservoir—Judith Basin County

Two project information signs installed.
Installed water recorders.
Facilities installed at picnic areas.

Middle Creek Project—Gallatin County

Cost-benefit project study made.
Two project information signs installed.

Lower Musselshell Canals—Musselshell County

Riprap placed on outlet structures.
Cleaned canals and installed turnouts.
Installed project information signs.
Timber bridge replaced by equipment crew.
Engineering assistance in repair of flood damages in spring of 1967.

Daly Ditches—Ravalli County

Cleaned canals and laterals.
Repaired damaged structures.

Petrolia Reservoir—Petroleum County

Conducted a cost-benefit study.
Installed project information sign.
Engineering staff negotiated, supervised and inspected concrete lining of 10,000 feet of canals.
Prepared recreation survey.

Cottonwood Storage—Park County

One project information sign installed.

Frenchman Storage—Phillips County

One project information sign installed.

Florence Canal—Lewis and Clark County

Installed a water measuring recorder.
Relined 350 feet of canal with concrete.

Paradise Canal—Park County

One project information sign installed.

The following are projects which were proposed and investigation requested by local groups interested in developing and purchasing project water, if found feasible. Meetings were held in the local areas with interested parties and the Board's findings were discussed.

North Chinook Project—Blaine County

Preliminary engineering report presented to the local group for reconstruction and enlargement of an existing private irrigation company's project for purposes of irrigation and fish and wildlife.

Boulder River Project—Jefferson County

Completed engineering and geological study of damsite and reservoir area for a Little Boulder site regarding a multiple-use storage structure. Preliminary engineering study for alternate "Bernice site" near Basin. Negotiated with U. S. Department of Agriculture. (SCS)

Upper Stillwater—Stillwater County

Completed preliminary study for Stillwater River site and alternate site on Trout Creek for a multiple-use storage project.

Sheep-Newlan Project—Meagher County

Compiled data for revision of 1938 Report, in cooperation with U. S. Department of Agriculture. (SCS)

Stillwater Project—Flathead County

Reconnaissance study completed in project area. Furnished the U. S. Bureau of Reclamation with data for development of a preliminary feasibility study.

Big Timber Creek—Sweetgrass County

Preliminary investigation of two possible storage sites.

Larb Creek—Phillips and Valley Counties

Preliminary report compiled for proposed project.

Willow Creek—Valley County

Compiled revised report on alternate sites for the construction of a scaled-down project. This proved infeasible.

WATER RESOURCES SURVEY

One of the Board's responsibilities is to obtain information regarding surface water rights in Montana. This investigation is conducted by the Board's Water Resources Survey Division which collects and compiles data concerning our present uses of surface water.

The Water Resources Survey was organized in 1943 under the former State Engineer's office for the purpose of compiling a complete inventory of Montana's surface water rights and their uses. The Water Resources Survey compiles this information by a thorough researching of county water right records on file with local county clerks and recorders and district courts and by direct contact with water users in an on-the-spot survey.

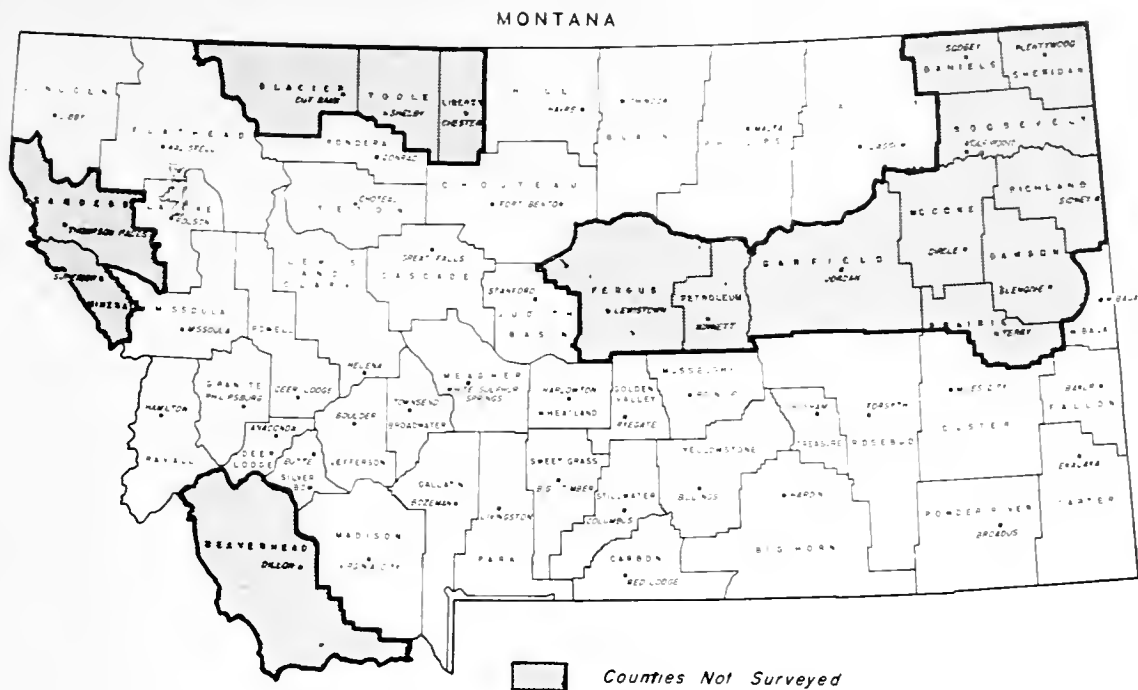
One of the final steps taken in the survey after obtaining the water rights is the compilation and publishing of county Water Resources Reports. The reports contain the history of land and water use in irrigated areas together with maps which show the irrigated areas and their sources of water supply. Until recently, only one or two counties could be completed each year.

At the end of the fiscal year, June 30, 1968, forty of the fifty-six counties were completed.

The map on the following page shows the counties surveyed and lists them alphabetically with the year of the survey publication, the amount of irrigated acres, the amount of irrigable acres under present facilities, and maximum irrigated and irrigable acres.



Frenchman Dam, Phillips County.



County	Year Survey Published	Irrigated Acres	County	Year Survey Published	Irrigated Acres
Big Horn	1947	91,957.84	Madison	1954	128,652.00
Blaine	1967	85,700.00	Meagher	1950	77,493.00
Broadwater	1956	53,253.00	Missoula	1960	39,354.90
Carbon	1946-1966	98,776.61	Musselshell	1949	21,173.75
Carter	1960	45,652.00	Park	1951	78,045.00
Cascade	1961	51,013.91	Phillips	1968	109,520.05
Chouteau	1964	19,261.49	Pondera	1964	138,507.30
Custer	1948	46,633.57	Powder River	1961	33,954.00
Deer Lodge	1955	24,411.00	Powell	1959	70,317.00
Fallon	1960	2,924.00	Ravalli	1958	107,368.43
Flathead	1965	30,554.98	Rosebud	1948	39,687.56
Gallatin	1953	156,424.75	Silver Bow	1955	7,567.00
Golden Valley	1949	17,262.97	Stillwater	1946	46,023.25
Granite	1959	38,478.00	Sweet Grass	1950	100,935.00
Hill	1967	13,271.00	Teton	1962	156,248.35
Jefferson	1956	29,576.00	Treasure	1951	27,942.00
Judith Basin	1963	22,011.00	Valley	1968	76,785.00
Lake	1963	112,911.43	Wibaux	1960	304.00
Lewis & Clark	1957	45,646.00	Wheatland	1949	55,152.40
Lincoln	1965	8,338.13	Yellowstone	1943	121,522.38

During this biennium surveys were completed in Blaine, Hill, Phillips, and Valley Counties. After all of the counties in the state are completed by the survey, continuing surveys will be necessary to update old surveys and to show how water is being used, and by whom, as new developments occur.

GROUNDWATER

In January, 1967, a Geologist was added to the staff of the Montana Water Resources Board to facilitate the Board's continuing efforts in gathering data on groundwater in Montana, and to provide additional capability on matters pertaining to Montana's water resources.

The Board continued to catalog new groundwater appropriations, received at the rate of approximately 100 per month, and to reply to numerous inquiries pertaining to groundwater rights and appropriation procedures, both from within Montana and out-of-state.

The Board established a controlled groundwater area in the vicinity of Baker, Montana, under provisions of the existing Groundwater Code. This resulted from a thorough appraisal of groundwater conditions in the Hell Creek-Fox Hills aquifer of eastern Montana, and the pattern of withdrawals of water from the aquifer. Prior to the establishment of the Controlled Area, the Board conducted a public hearing at Miles City and heard testimony by all interested parties. An Order was subsequently issued by the Board, limiting the total withdrawal of Hell Creek-Fox Hills water to that as of the date of the Order and allowing no additional water wells to be drilled into this aquifer without prior approval of the Board, within an area in excess of 100,000 acres along the western flank of the oil-producing Cedar Creek anticline. As part of a program of continuing surveillance of groundwater conditions within this Controlled Area, water levels in key observation wells are measured monthly by the U. S. Geological Survey. Monthly reports of amounts of water used are submitted to the Board by the water users. These types of data are being collected to provide an understanding of the behavior of important artesian aquifers in Montana.

A continuing comprehensive inventory of the State's groundwater resources was started in 1967. The inventory has been made on a county by county basis, using data available on groundwater appropriation forms in the files of the MWRB, which is the Administrator of Montana's Groundwater Code, and data from published reports. These county by county inventories attempt to show in a general way the availability of groundwater through wells and springs in Montana, and they cover such topics as general geology, aquifers, and groundwater areas. Practical consideration is given to such items as depth of aquifer, well yield, quality of water, and water use. Inventories have been completed for Blaine, Hill, Phillips, and Valley Counties and are now in progress for six other counties. In conjunction with an inventory of groundwater resources in Carbon County which is now in progress, the Board is maintaining a field party of Geologists in the county, engaged in the task of investigating reported problem areas. The Water Board is doing this at the request of the Carbon County Soil and Water Conservation District. To-date the field party has mapped the extent of alluvium along major streams, has made a composite field inventory of water wells, has compiled pertinent data from well logs and publications, and has participated in discussions with personnel of the Soil and Water Conservation District, the U. S. Soil Conservation Service, the Montana Bureau of Mines and Geology, and the U. S. Geological Survey. Future field work is planned to include making an inventory of irrigation wells, mapping the general geology, and measuring water table depths and alluvium thicknesses, where possible, by means of a portable seismograph. Data collected in the field will be incorporated in the groundwater inventory.

LAND CLASSIFICATION

The Land Classification Division of the Water Resources Board was established in December, 1966. As Montana's population steadily grows and becomes more affluent, more land and water is needed for agriculture, municipalities, industries, recreation, and other uses. This fact alone makes it necessary for the State to estimate the quantities of land and water which will be required by its citizens over the next 50 to 100 years. The State's ultimate water needs are being determined by a study plan which must consider the future lands required for irrigation. Agriculture is, and undoubtedly will remain, the leading industry in Montana.

Future expansion of agricultural needs will be met primarily through increased irrigation. One of the Board's primary responsibilities is to determine which areas in the State can be considered for

expansion of irrigated agriculture. This determination is the primary function of the Board's Land Classification Division. Field land classification surveys, research of all available soils information, and the compiling of data from Federal and State Agencies are necessary to determine the future lands suitable for irrigation.

The ultimate land use must be considered for a comprehensive study of the water needs of Montana. Land classification is the systematic appraisal of lands and their designation by categories on the basis of similar characteristics. Land classification by the Water Resources Board is conducted for the specific purpose of establishing the extent and degree of suitability of lands for a sustained irrigation farming.

The southwestern states have initiated proposals to transport Columbia River water to their arid areas for the purpose of irrigation, and other water uses. This action has accelerated and made urgently necessary a land classification of all lands within the Columbia River Basin, in which part of Western Montana lies. The Water Board's Land Classification Division and the Bureau of Reclamation's Land Classification Section entered into a cooperative agreement to classify all Columbia River Basin land in Montana. The land was classified for its ultimate irrigable potential regardless of water supply or project boundaries. This classification is a general reconnaissance survey which furnishes an inventory of arable lands regardless of location, elevation or anticipated agricultural use. Land classification standards were jointly adopted by the two Agencies and were used in the field to delineate the land into classes: 1 arable; 2 arable; 3 arable; and class 6 non-arable. The total acreage of future arable land plus presently irrigated land within the Columbia Basin of Montana will be large. Slopes averaging 25 percent gradient can be anticipated for irrigation within the long term future needs. The acceleration of sprinkler irrigation and the need for future irrigated pasture should include the planning of 25 percent slopes for future irrigation. It is anticipated that land classification maps showing the areas of presently irrigated land and future potential irrigation will be available in the near future.

The U. S. Soil Conservation Service also cooperates with the Board's Land Classification Division by furnishing soil surveys of all areas they have mapped. Joint meetings concerning irrigated and future potential arable lands are held frequently in order to prevent any unnecessary duplication of work within a study area.

As previously stated, the Board's Water Resources Survey Division completed surveys of water rights and water uses in Blaine, Hill, Phillips and Valley Counties during this biennium. The soils of these counties are considered to be a vital resource for present and future irrigation. The Land Classification Division is charged with evaluating and studying all available soils information and compiling this information into a written section in each county report. The available soils survey and land classification information of the Soil Conservation Service and Bureau of Reclamation were discussed with each agency's Soil Scientists. The information thus obtained, plus other soils information available, was used for writing and preparing illustration maps in the Water Resources Survey publications. Field trips to each county were made to investigate the soil, topography and drainage features of the land for the mapping of large land areas for future irrigation planning. The areas mapped as arable in the county reports are for general information and should not be considered as detailed studies; further study work is necessary before any specific land areas can be considered for project development.

The Land Classification Division is responsible for the land classification of all land under any new project. The construction and planning of future irrigation projects is one of the vital elements for water resources planning. It must be remembered that the two basic resources necessary for a feasible irrigation project are land and water. The quality and quantity of these two resources determines the future economic outcome of an irrigation project; in many cases the irrigation of poor soil, or lack of drainage has caused undue hardships not only to the farmer but also to the local businessman, county tax revenues and other features of a community. These hardships can be avoided by appraising the soils, topography and drainage features, as part of a land classification which shows the ability of the land to withstand a sustained irrigated agriculture. Land classification is an essential part of the Board's project plans and is conducted for the specific purpose of establishing

the extent and degree of suitability of lands for sustained irrigation farming. The main report prepared during this biennium is the Willow Creek Project. The Sidney Project and Boulder Project are being further investigated for future feasibility of irrigation.

The Land Classification Division cooperates with the Soil Conservation Service whenever a project is jointly planned for future irrigation development under Public Law 566. The soil survey and watershed planning of the Soil Conservation Service is reviewed and further fieldwork is conducted in affected areas, if necessary. Duplication of work is held to a minimum.

Land classification is developed for a specific purpose, it cannot be expected to supply answers to all land use problems, or even to all those encountered in irrigation farming. It is designed, however, to provide definite, sound, and relatively permanent basic data which are essential to solving economic and engineering problems associated with the Water Resources Board's work. It is anticipated that the data compiled and the work conducted by the Land Classification Division will become a very important and worthwhile phase of the future planning of irrigation in Montana.

WEATHER MODIFICATION

Effective on July 1, 1967, the Montana Water Resources Board became responsible for administering Montana's new Weather Modification Act. The primary responsibilities include (1) holding public hearings to assess proposed weather modification projects, (2) establish rules and regulations governing weather modification, and (3) issue licenses and permits for engaging in weather modification.

Two licenses were issued this biennium and one applicant was refused due to a lack of educational qualifications. There were no permit fees collected because an opinion of the State Attorney General advised that there can be no interference with presently existing contracts. Both of the firms which were licensed were already operating under contracts in Montana. One of these contracts, as provided therein, has been renewed. This is for an operation in the Hungry Horse area. The other licensee completed the contract which he held and thus did not reapply for a license for the second half of the biennium.

TREATIES AND COMPACTS

The State Water Resources Board is, by law, Montana's representative in negotiations between the various states and the Federal Government on agreements or compacts regarding interstate waters. These agreements must, however, be ratified by the several State Legislatures and by the Congress in order to become effective.

Yellowstone River Compact

Montana's only operating compact is the Yellowstone River Compact between the States of Montana, Wyoming, and North Dakota. This compact provides for the allocation and use among the three states of the waters of the Yellowstone River and its tributaries—except for that part in Yellowstone National Park. The Yellowstone Compact provides that all water rights on these streams which were perfected prior to January 1, 1950, are vested and are not subject to the terms of the Compact. In addition, the terms specify that this water should not be diverted outside the Yellowstone River Basin. The Director of the Montana Water Resources Board, the State Engineer in Wyoming, and a representative appointed by the U. S. Geological Survey are members of the Compact Commission. North Dakota is not required to contribute funds toward the operation of the Compact and it does not have a vote in the meetings. The Federal representative is the chairman, but he has no vote except in the case of a tie.

In order to administer this Compact, it became necessary to keep a compilation of the water rights filed within Montana and Wyoming after January 1, 1950. Such information was available in Wyoming, but Montana had no provision for recording water rights with the State. The 1953 Montana Legislature attempted to correct this situation by passing a law which requires all water right

appropriations filed in the areas of the Yellowstone River Basin affected by the Compact to also be filed in the Board's Office. Apparently either through oversight, or ignorance of the law at the local level, only a small number of appropriations have been received by the Board. Furthermore, these filings only indicate the amount of water claimed by an appropriator; they do not and cannot show proof of the actual amount of water used. Thus, it is becoming necessary for the Board's Water Resources Survey Division to restudy some of the counties within the Yellowstone River Basin to determine how much water remains for appropriation in Montana under the terms of the Compact, in order to evaluate future claims to water by either Montana or Wyoming.

During this biennium, it became necessary to allocate the waters of the Tongue River under terms of the Compact. As irrigation use and industrial development increase in the Basin, allocation of all of the Basin's waters may become necessary.

Waterways Treaty (St. Mary and Milk Rivers)

According to the Waterways Treaty, signed in 1909 by the United States and Great Britain, the water of the St. Mary and Milk Rivers and the international tributaries of the Milk River are to be divided equally between the United States (Montana) and Canada. In making such equal apportionment, however, more than half of the water may be taken from one river and less than half from the other by either country so as to afford a more beneficial use of each. During the irrigation season, the United States is entitled to a prior appropriation of three-fourths of the natural flow of the Milk River and Canada is entitled to three-fourths of the natural flow of the St. Mary River. The principal international tributaries affecting Montana are Sage Creek (North of Havre), Lodge and Battle Creeks (North of Chinook) and Frenchman Creek (North of Saco).

International Stream Measurement

The U. S. Geological Survey (in cooperation with the Board), in behalf of the United States, and the Department of Mines and Technical Surveys, in behalf of Canada, conduct stream measurements on their respective sides of the International Boundary. Allocation of water to the two countries are made every ten days throughout the irrigation season in accordance with an order of the International Joint Commission. Nevertheless, as more land is irrigated and more storage reservoirs are built in Canada, less water flows across the Boundary to Montana. In addition, some Canadian officials believe that the Treaty meant to give each country half of the annual flow of each stream. Under such an interpretation Montana might receive its half in March, during the spring runoff, before the ground is properly thawed or before any irrigation is desired and then not be eligible for any water during the irrigation season. Another problem with respect to stream measurement and water allocation is the contention that Montana should have better records of its water use and efficiency. In attempting to resolve these problems, the Board makes field inspections of international streams and meets with Canadian officials for the purpose of determining reduced flows to Montana and the reaching of mutual agreement on procedures for apportioning international waters.

WATER PLANNING

Planning activities of the Montana Water Resources Board may be categorized according to geographical dimensions. The types of planing the Board engages in are: (1) Project planning, (2) State planning, and (3) Basin or Interstate planning. Since its original creation as the former Water Conservation Board in 1934, the Board has been extensively engaged in project planning and construction. Basin planning experience of the Board dates back to the early 1940's. State water planning, as defined and designated by the legislature, was initiated this biennium. The above types of planning are closely interrelated and most work in one type has several applications to one or both of the other types.

Project Planning

Project planning proceeds along three basic chronological phases: (1) feasibility investigations of proposed projects, (2) construction plans, and (3) operation and expansion plans. During the 1966-1968

biennium investigations were completed or initiated for eight projects. (See the section on Engineering and Project Operation and Maintenance in this report.) Preliminary results indicate that those projects are feasible from an engineering basis. However, testing of potential dam sites has not been completed in all cases.

Revised construction investigations and plans were completed for the proposed Willow Creek project in Valley County. The revised analysis showed that alternate sites for a smaller dam along the creek were not feasible.

Operation and expansion plans during the biennium were keynoted by potential development for the existing Tongue River Dam (or a new dam) and the study of recreational potentials for Board projects. These activities were in addition to routine planning for project repairs and maintenance.

State Planning

On July 1, 1967, funds appropriated for the preparation of a "comprehensive coordinated multiple use state water plan" became available to the Board. A framework outline and a set of assumptions to guide the State Water Plan were prepared and essential staff specialists were added as initial steps in the planning process. In addition to staff expansion, an internationally prominent water planning consultant was retained to advise the Board on the State Water Plan.

Preparation of the State Water Plan will be conducted in four phases, the last three of which will be somewhat concurrent. The phases of the plan are: (1) an inventory of the state's water resources and water data, (2) projections of future water needs, (3) recommendations for action to meet future needs, and (4) implementation of the plan. During this biennium efforts were confined to the inventory phase; the assimilation of basic information. Specific programs initiated or expanded as part of the inventory phase are summarized below.

1. Water Resources Survey. This program was accelerated to a schedule of five counties per year. The reports were expanded to include information developed under the land classification and ground water program. (See below.)

2. Groundwater Inventory. The essence of this program is the compilation and mapping of data on (1) appropriations and use of groundwater, (2) quantity and quality of groundwater and aquifers, (3) yields of wells and springs, and (4) depths and levels of groundwater. This program is coordinated with the groundwater research program of the state and federal agencies, notably the State Bureau of Mines and Geology in Butte.

3. Land Classification. A program to classify land and estimate existing and future irrigation was inaugurated during the biennium. Information is compiled, mapped, and reported on a county by county basis. This biennium a cooperative agreement with the U. S. Bureau of Reclamation was entered into for the classification of lands in the eleven western counties constituting Montana's portion of the Columbia Basin.

4. Data Storage and Retrieval System. Work has begun on developing a water data storage and retrieval system for the Board. The State Department of Administration, Division of Data Processing, is developing the system to the Board's standards. The system is being developed so that it is compatible with those of the U. S. Geological Survey and the State Bureau of Mines. The program will also be able to interchange information with the data systems of the University units.

The system is being developed so that records on streamflow, groundwater, appropriations, decrees, withdrawals, and quality, for example, could be easily obtained and compared for the state or by counties and drainages.

Two major contracts for research relevant to the state water plan were negotiated during the biennium. Those were:

1. State Economic Base Study. The Board entered into a contract supporting a state economic base study to be conducted by the Bureau of Business and Economic Research at the University of Montana. This biennium the Board, by the terms of the contract, contributed \$20,700 toward the economic base study. Besides the Board, the State Department of Planning and Economic Development is a party to the contract.

2. Basin Simulation Model. The Joint University System Water Resources Research Center at Bozeman is under contract with the Board to develop a river basin simulation model. The purpose of the model is to provide the Board a method of evaluating alternative developments or changes in a drainage basin.

Basin Planning

The planning for the Missouri Basin is being carried on by the Missouri Basin Inter-Agency Committee, and in the Columbia by the Columbia-North Pacific Study (The CNP). The Board's staff participates in the Missouri Basin Study through membership in the Standing Committee and membership on Work Groups and Task Forces dealing with:

State Activities	Missouri Basin
Economic Base Study	Missouri Basin
Power	Missouri Basin
Ground Water	Missouri Basin
Water & Related Land Resource Development for the Yellowstone, Upper Missouri and Little Missouri	
Irrigation Efficiencies for the Yellowstone, Missouri and Little Missouri	

Participation in the C-NP is through the following Work Groups:

Land and Minerals	Columbia Basin
Hydrology	Columbia Basin
Economics	Columbia Basin
Land Measures & Watershed Protection	Columbia Basin
Irrigation	Columbia Basin
Water Qualities	Columbia Basin
Power	Columbia Basin
Pacific Northwest River Basins Commission	

In addition to active participation in the Work Groups and Task Forces the Board has furnished essential information on water and water development to other agencies who are involved in river basin planning.

Generally, the Board's activities in this area are two-fold: one, to establish surveillance over the content and direction of the inventory and planning reports so that Montana's interests are not overlooked or subjugated to some other state or federal agency; and two, to influence the preparation of the basin reports and inventories as much as possible so that the material will be usable in preparing Montana's Water Plan.

FINANCIAL SUMMARY

Fiscal Year 1967

Financial transactions for the former State Water Conservation Board are covered in the following report for the period July 1, 1966, to and including June 30, 1967.

The total gross expenditure for the State Water Conservation Board during the period amounted to \$587,249.58, as compared with \$511,187.52 for the previous year.

The total income and refunds to the State Water Conservation Board amounted to \$316,968.17 as compared with \$315,709.91 the year before. A total of \$146,468.17, composed of income and refunds on various State Water Conservation Board projects in the amount of \$139,650.03, interest income of \$3,307.61, and miscellaneous income and refunds amounting to \$3,510.53, was deposited in the State Water Conservation Board's earmarked revenue fund. The balance of \$170,500.00 was income from projects on which bonds had been issued. These bonds are now owned by the state's General Fund and this sum was applied to the redemption of interest coupons and bonds. Total income received during the year to cover payment of interest coupons and bonds was \$170,382.64. A balance of \$4,920.31 was carried over from the previous year, making a total of \$175,302.95 available. After payment of interest coupons and bonds in the amount of \$170,500.00 and trustee fees in the amount of \$1,063.18, a balance of \$3,739.77 remained in the various trustee banks on June 30, 1967.

There was encumbered on June 30, 1967, purchase orders amounting to \$64,439.85. A reversion of \$32.25 was made to the General Fund and \$2,181.68 to the Earmarked Revenue Fund from appropriations.

A budget amendment was approved during the period to expend \$28,700.00 from Federal funds received under the Water Resources Planning Act (Public Law 89-80) to increase the State Water Conservation Board's efforts in its state water and related land resources planning.

The funds along with their respective balance, appropriation, expenditure, reversion and encumbrance for the period are as follows:

State Water Conservation Board						
		Balance 7-1-66	Appropriation	Expenditures 7-1-66 thru 6-30-67	Reverted	Encumbered 6-30-67
Operation	57104	\$ 9,058.76	\$157,180.00	\$155,374.31	\$ 22.68	\$ 10,841.77
Operation	75808	648.00	71,700.00	71,700.00		648.00
Flood Control	75802	1.00			1.00	
Salary Director	75801		10,000.00	10,000.00		
Capital	57102	1,915.48	2,700.00	4,498.79	5.69	111.00
Capital	75802	23,343.83	23,300.00	39,489.10	2.88	7,151.55
Operation	31601	60,356.29	265,000.00	279,286.33	2,181.68	43,838.23
Operation & Capital (Fed)	26802		28,700.00	26,901.00		1,799.00
TOTAL		\$ 95,323.36	\$558,580.00	\$587,249.58	\$ 2,213.93	\$ 64,439.85

Fiscal Year 1968

Financial transactions of the new Montana Water Resources Board are covered in the following report for the period July 1, 1967, to and including June 30, 1968.

The total gross expenditure of the Board for the period amounted to \$1,121,541.30 as compared with \$587,249.58 for the previous year.

The total income and refunds to the Board amounted to \$298,239.54 as compared to \$316,968.17 the previous year. A total of \$143,539.54, composed of income and refunds on various Montana Water Resources Board projects in the amount of \$141,812.80 and interest income in the amount of \$1,726.74, was deposited in the Board's earmarked revenue fund. The balance of \$154,700.00 was income from projects on which bonds had been issued. These bonds are now owned by the State's General Fund and this sum was applied to the redemption of interest coupons and bonds. The total income received during the year to cover payment of interest coupons and bonds was \$156,291.94. A balance of \$3,739.77 was carried over from the previous year, making a total of \$160,031.71 available. After payment of interest and coupons in the amount of \$154,700.00 and trustee fees in the amount of \$1,210.07, a balance of \$4,121.64 remained in the various trustee banks on June 30, 1968.

There were encumbered on June 30, 1968, purchase orders amounting to \$32,176.81. A reversion of \$99.53 was made to the General Fund and \$93.61 to the earmarked revenue fund from appropriations.

